

CLAIMS

We claim:

1. A method of making optical disks, comprising:
  - providing a father stamper, wherein the
  - 5 father stamper comprises spiral protrusions on a first surface corresponding to original laser cuts;
  - coating the first surface of the father stamper with nickel;
  - 10 separating the nickel from the first surface to produce a second stamper having groove recesses on a first surface, wherein the groove recesses are mirror images of the spiral protrusions;
  - covering the first surface of the second
  - 15 stamper with a plastic material;
  - separating the plastic material from the second stamper, wherein the plastic material has lands corresponding to the groove recesses of the second stamper; and
  - 20 depositing a phase-change material over the lands, wherein the phase-change material is in a first state upon deposition and in a second state after being written to, and wherein the change from the first state to the second state changes
  - 25 the optical phase of the phase-change material in the positive direction.
2. The method of Claim 1, wherein the covering comprises injecting the plastic material using an
- 30 injection molding process.

3. The method of Claim 1, wherein the phase-change material is an SbInSn alloy.

4. The method of Claim 1, wherein the providing  
5 comprises:

providing a glass master disk with a first  
and a second principle surface;

depositing a photoresist layer on the first  
principle surface of the disk;

10 removing selected portions of the photoresist  
layer;

depositing nickel over the photoresist layer;  
and

15 separating the nickel from the photoresist  
layer to form the father stamper.

5. The method of Claim 4, wherein the removing is  
by laser ablation.

20 6. The method of Claim 4, wherein the removing  
comprises:

exposing the selected portions of the  
photoresist layer; and

etching the selected portions.

25 7. The method of Claim 6, wherein the exposing is  
performed with a laser and results in the original  
laser cuts in the photoresist layer.

30 8. The method of Claim 1, wherein data is written  
to the lands from exposure by a light source.

9. The method of Claim 4, further comprising rotating the glass master disk and exposing the selected portions with a laser prior to the etching.

5 10. The method of Claim 4, wherein the deposited photoresist layer is between approximately 20 nm and 120 nm.

10 11. The method of Claim 4, wherein the deposited photoresist layer is between approximately 80 and 90 nm.

15 12. The method of Claim 1, further comprising depositing a protective layer over the phase-change material.

13. The method of Claim 12, wherein the protective layer comprises silicon oxynitride.

20 14. The method of Claim 1, wherein the father stamper further comprises bump protrusions on the first surface of the father stamper corresponding to original laser cuts, the second stamper further comprises pit recesses on the first surface of the second stamper,  
25 and the separated plastic material further has bumps corresponding to the pit recesses of the second stamper, and the method further comprising depositing the phase-change material over the bumps.

30 15. The method of Claim 1, wherein the second stamper is a mother stamper.

16. The method of Claim 1, wherein the father stamper is a first generation stamper, and the second stamper is an even-numbered generation stamper.

5 17. The method of Claim 1, wherein the second stamper has features that are opposite in polarity to features of the father stamper.

10 18. The method of Claim 1, wherein the plastic material is a polycarbonate material.

19. A method of forming an optical disk, comprising:

15 providing a stamper, wherein the stamper has grooves corresponding to an original laser cut; filling the grooves with a plastic material; separating the plastic material from the stamper, wherein the plastic material has lands corresponding to the grooves; and  
20 depositing a phase-change material over the lands, wherein the phase-change material has a positive optical phase shift at portions that are written to, wherein the shift is caused by a physical change in the material and a change in  
25 optical constants of the material.

20. The method of Claim 19, wherein the phase-change material comprises a SbInSn alloy.

30 21. The method of Claim 19, wherein data is written on the lands.

22. The method of Claim 21, wherein the data is read by tracking along the lands.

23. The method of Claim 19, wherein the bumps are  
5 between approximately 80 nm and 90 nm in height.

24. The method of Claim 19, wherein the stamper further comprises pits corresponding to the original laser cut, the method further comprising:

10       filling the pits with the plastic material,  
      wherein the plastic material also has bumps corresponding to the pits; and  
      depositing the phase-change material over the bumps.

15       25. The method of Claim 19, wherein the stamper is a mother stamper.

26. The method of Claim 19, wherein the plastic  
20 material is a polycarbonate material.

27. A method of making an optical disk from a stamper, the stamper comprising a recessed spiral groove corresponding to an original laser cut, the  
25 method comprising:

      covering a first surface of the stamper containing the recessed spiral groove with a plastic material;

30       separating the plastic material from the stamper, wherein the plastic material has lands corresponding to the spiral groove of the stamper;  
      and

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depositing a phase-change material over the  
lands, wherein the phase-change material is in a  
first state upon deposition and in a second state  
after being written to, and wherein the change  
5 from the first state to the second state changes  
the optical phase of the phase-change material in  
the positive direction.

28. The method of Claim 27, wherein the stamper  
10 further comprises a spiral pattern of pits on the first  
surface corresponding to the original laser cut,  
wherein the plastic material also has bumps  
corresponding to the pits, and further comprising  
depositing the phase-change material over the bumps.

15 29. The method of Claim 27, wherein data is  
written on the lands.

30. The method of Claim 27, wherein the stamper  
20 is a mother stamper.

31. The method of Claim 27, wherein the plastic  
material is a polycarbonate material.